

Hayden Middle School
Math Tournament 2019
Pre-Algebra

List the numbers in the given set that belong to the indicated set.

1) Given $\left\{17, \sqrt{7}, -23, 0, \frac{0}{6}, \sqrt{9}, \frac{-6}{0}\right\}$, list the numbers in this set that also belong to the set of Real numbers. 1) _____

- A) $17, \sqrt{7}, -23, 0, \frac{0}{6}, \sqrt{9}$ B) $17, -23, 0, \frac{0}{6}, \sqrt{9}$
C) $17, -23, 0, \frac{0}{6}, \frac{-6}{0}$ D) $17, -23, 0, \sqrt{9}$

Solve the problem. Round to two decimal places

2) In the following formula, y is the minimum number of hours of studying required to attain a test score of x: $y = \frac{0.48x}{100.5 - x}$. How many hours of study are needed to score 91? 2) _____

- A) 9.63 hr B) 99.97 hr C) 46.00 hr D) 4.60 hr

Find the product or quotient.

3) $\frac{9x^2 + 64x - 64}{5x - 20} \cdot \frac{x^2 - 4x}{81x^2 - 64} \div \frac{8x + 64}{3x^3}$ 3) _____

- A) $\frac{3x^3}{40(9x + 8)}$ B) $\frac{8(x + 8)^2}{15x^2(9x + 8)}$ C) $\frac{3x^4}{40(9x + 8)}$ D) $\frac{40}{3x^4(9x + 8)}$

Find the product. Assume variables represent positive real numbers.

4) $(m^{1/4} + m^{-1/4})(m^{-1/4} - m^{1/4})$ 4) _____
A) $m - m^{1/2} + m^{-1/2} - 1$ B) $m^{1/2} - m^{-1/2}$
C) $-m^{1/2} + m^{-1/2}$ D) $1 - m^{1/2} + m^{-1/2} - m$

Perform the indicated operations. Write the result using only positive exponents. Assume all variables represent nonzero real numbers.

5) $\frac{16r^3(r^4)^5}{11(r^{-5})^{-3}}$ 5) _____

- A) $\frac{16r^8}{11}$ B) $\frac{16}{11r^8}$ C) $\frac{16}{11r^{20}}$ D) $\frac{16r^{20}}{11}$

Write the expression with only positive exponents and evaluate if possible. Assume all variables represent nonzero real numbers.

6) $\frac{\frac{5}{p^2 - 36} + p}{\frac{1}{p + 6}}$ 6) _____

- A) $\frac{5 + p^2 - 36p}{p + 36}$ B) $\frac{5 + p^3 - 36p}{p - 6}$ C) $\frac{1}{p^2 + 6}$ D) $\frac{5 + p^3 + 36p}{p}$

Write the expression in lowest terms.

7) $\frac{m^3 - 64}{m - 4}$

7) _____

A) $x^2 + 16$

B) $x^2 - 4$

C) $x^2 + 4x + 16$

D) $x^2 - 16x + 4$

8) The cost of manufacturing clocks is given by $c = 64(n + 4)^{1/2}$, where c is the cost in dollars and n is the number produced. What is the cost when no clocks are produced?

8) _____

A) \$256

B) \$16

C) \$64

D) \$128

Perform the indicated operations.

9) $\frac{-81x}{7(9x + 1)} + \frac{1}{7x(9x + 1)} - \frac{4}{x}$

9) _____

A) $\frac{-81x^2 - 252x - 27}{63x^2 + 7x}$

B) $\frac{-81x^2 - 252x - 27}{7x}$

C) $-\frac{9(x + 3)}{63x^2 + 7x}$

D) $-\frac{9(x + 3)}{7x}$

Simplify the expression. Assume all variables represent positive real numbers.

10) $\sqrt[4]{\frac{256}{y}}$

10) _____

A) $\frac{4\sqrt[4]{y^2}}{y}$

B) $\frac{4\sqrt[4]{y^3}}{y}$

C) $\frac{4\sqrt[4]{y^3}}{y^2}$

D) $\frac{4\sqrt[4]{y}}{y}$

Find the domain of the expression.

11) $\frac{x^2 - 9}{x^2 + 6x + 8}$

11) _____

A) $\{x \mid x \neq 0\}$

B) $\{x \mid x \neq 3 \text{ and } x \neq -3\}$

C) $\{x \mid x \neq 4 \text{ and } x \neq 2\}$

D) $\{x \mid x \neq -4 \text{ and } x \neq -2\}$

Factor

12) $z^6 - 64a^6$

12) _____

A) $(z^3 + 8a^3)(z^3 - 8a^3)$

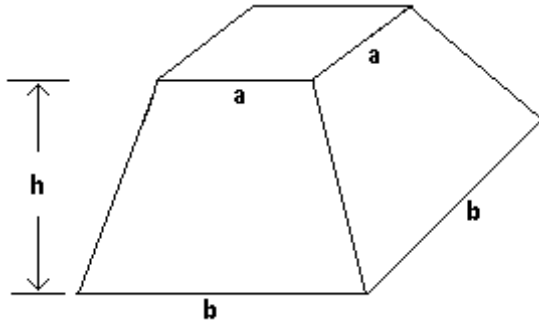
B) $(z + 2a)(z - 2a)(z^4 + 4z^2a^2 + 16a^4)$

C) $(z + 2a)(z - 2a)(z^2 + 2za + 4a^2)(z^2 - 2za + 4a^2)$

D) $(z^2 - 4a^2)(z^4 + 4z^2a^2 + 16a^4)$

- 13) The formula used to find the volume of the frustum of a square pyramid is $V = \frac{1}{3} h (a^2 + ab + b^2)$, 13) _____

where b is the length of the base, a is the length of the top, and h is the height. Calculate the volume if $a = 271$ feet, $b = 671$ feet, and $h = 207$ feet.



- A) 48,681,087 cubic feet
 B) 146,043,261 cubic feet
 C) 48,682,087 cubic feet
 D) 48,691,087 cubic feet

Divide

- 14) $\frac{25y^4 + 20y^3 + 4y - 1}{5y^2 + 1}$ 14) _____

- A) $5y^2 + 4y$ B) $5y^2 - 1$ C) $5y^2 - 4y + 1$ D) $5y^2 + 4y - 1$

Expand Binomial

- 15) $(2x + 3)^4$ 15) _____

- A) $48x^4 + 288x^3 + 216x^2 + 648x + 81$
 B) $16x^4 + 96x^3 + 216x^2 + 216x + 81$
 C) $(4x^2 + 6x + 9)^4$
 D) $16x^3 + 96x^2 + 216x + 216$

Simplify

- 16) $n^2 \left(3n - \frac{1}{10} \right) \left(10n + \frac{1}{5} \right)$ 16) _____

- A) $30n^4 - \frac{2}{5}n^3 + \frac{1}{50}n^2$
 B) $30n^4 - \frac{8}{5}n^3 - \frac{1}{50}n^2$
 C) $30n^4 - \frac{2}{5}n^3 - \frac{1}{50}n^2$
 D) $30n^4 + \frac{2}{5}n^3 - \frac{1}{50}n^2$

Simplify the expression. Assume all variables represent nonzero real numbers.

- 17) $\left(\frac{4x^2y^4}{z^3} \right)^3$ 17) _____

- A) $\frac{64x^5y^7}{z^6}$ B) $\frac{4x^6y^{12}}{z^6}$ C) $\frac{4x^6y^{12}}{z^9}$ D) $\frac{64x^6y^{12}}{z^9}$

- 18) If the radius of a sphere is doubled, by what factor will the volume change? 18) _____

- A) 6 B) 2 C) 4 D) 8

Simplify the rational expression. Assume all variable expressions represent positive real numbers.

19) $\frac{5(5x - 1)^{1/3} - (x - 1)(5x - 1)^{-2/3}}{(5x - 1)^{2/3}}$ 19) _____

- A) $\frac{24x - 4}{(5x + 1)^{4/3}}$ B) $\frac{26x + 4}{(5x + 1)^{4/3}}$ C) $\frac{26x - 4}{(5x + 1)^{5/3}}$ D) $\frac{24x + 4}{(5x + 1)^{5/3}}$

20) The Blood Alcohol Concentration (BAC) of a person who has been drinking is given by the expression 20) _____

$$\text{number of oz} \times \% \text{ alcohol} \times .075 \div \text{body weight in lb} - \text{hours of drinking} \times .015.$$

Find the BAC to the nearest thousandth for a 174-lb woman, who, in 3 hours, has drunk 4 16-oz beers (64 oz), each having a 3.2% alcohol content.

- A) -0.207 B) 0.043 C) -199.912 D) -0.023

Perform the indicated operations. Write the answer using only positive exponents. Assume all variables represent positive real numbers.

21) $\left(\frac{n^{-3/8}}{x^{-2/7}}\right)^3 \left(\frac{x^{1/6}}{n^{1/5}}\right)^{-1}$ 21) _____

- A) $\frac{n^{53/40}}{x^{43/42}}$ B) $\frac{x^{29/42}}{n^{37/40}}$ C) $\frac{n^{37/40}}{x^{29/42}}$ D) $\frac{x^{43/42}}{n^{53/40}}$

Use these sets to find the following. Identify any disjoint sets.

22) Let $U = \{5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15\}$, $M = \{5, 7, 9, 11\}$, $N = \{6, 8, 10, 12, 14\}$, $Q = \{5, 7, 9, 11, 13, 15\}$, and $R = \{5, 6, 7, 8\}$. 22) _____

$Q' \cap (N' \cap U)$

- A) \emptyset ; Q' and $(N' \cap U)$ are disjoint sets. B) $\{6, 8, 10, 12, 14\}$
 C) $\{5, 7, 9, 11, 13, 15\}$ D) $\{6, 7, 8, 9, 10, 11\}$

Perform the indicated operation and write your answer with positive integer exponents.

23) $\frac{x^2 - 25y^{-2}}{(x - 5y^{-1})(x + 5y^{-1})}$ 23) _____

- A) $\frac{y^2 - x}{xy - 5}$ B) 1 C) -1 D) $\frac{xy^2}{y - x}$

Evaluate the expression for $x = -2$, $y = 3$, and $a = -4$.

24) $\frac{-(x + 3)^2 - 7y}{-2 - a}$ 24) _____

- A) 11 B) 10 C) -11 D) -2

Factor, using the given factor. Assume all variables represent positive real numbers.

25) $24y^4(2y + 1)^{-2/5} + 32y^3(2y + 1)^{3/5} - 64y^2(2y + 1)^{8/5}$; $8y^2(2y + 1)^{-2/5}$ 25) _____

- A) $8y^2(2y + 1)^{-2/5}(-19y^2 - 28y - 8)$ B) $8y^2(2y + 1)^{-2/5}(-21y^2 - 28y - 8)$
 C) $8y^2(2y + 1)^{-2/5}(19y^2 - 28y + 8)$ D) $8y^2(2y + 1)^{-2/5}(21y^2 - 28y + 8)$

Answer Key

Testname: HAYDEN MIDDLE PRE-ALGEBRA 2019

- 1) A
- 2) D
- 3) C
- 4) C
- 5) A
- 6) B
- 7) C
- 8) D
- 9) D
- 10) B
- 11) D
- 12) C
- 13) A
- 14) D
- 15) B
- 16) C
- 17) D
- 18) D
- 19) A
- 20) B
- 21) B
- 22) A
- 23) B
- 24) C
- 25) B